

What is claimed is:

1 A method of optical detection of characteristic quantities of an illuminated specimen, comprising:

detecting a signal that is backscattered, reflected and/or fluoresced and/or transmitted from the specimen by a spatially resolving detector wherein radiation coming from the specimen is imaged on the detector;

shifting the position of the radiation which is measured in a spatially resolved manner relative to the detector; and

determining intermediate values by an algorithm from the signals measured in different shifts for purposes of increasing the spatial resolution of the detector.

2. The method according to claim 1, wherein the step size in the shift is below the raster dimension of the spatial resolution of the detector.

3. The method according to claim 1, wherein there is carried out a displacement of the detector in the direction of its spatial resolution and/or a displacement or swiveling of an imaging element in at least one axis and/or a displacement or swiveling of a reflective element in at least one axis and/or a displacement or swiveling of a dispersive element in at least one axis.

4. The method according to claim 1, wherein a spectrally resolved measurement of spectra is carried out by a dispersive element arranged in front of the detector.

5. The method according to claim 1, wherein the dispersive element is swivelable around at least one axis.

6. The method according to claim 1, wherein with a dispersive

element remaining stationary in at least one of its swiveling axes, the spatially changing effect of the swiveling in this axis is carried out by a scan unit and/or by displacement of the detector.

7. The method according to claim 1, wherein in a line scanner for real-time microscopy a displacement is carried out by a mirror which is swivelable about at least one axis and/or a displacement of the detector and/or a mirror of a scanning mirror arrangement is carried out.

8. The method according to claim 1, wherein with a mirror remaining stationary in at least one of its swiveling axes, the spatially changing effect of the swiveling in this axis is carried out by a scan unit and/or by displacement of the detector.

9. The method according to claim 1, wherein switching is carried out between a line scan and a dispersive splitting.

10. The method according to claim 1, wherein a dispersive element is swiveled for increasing the spectral resolution and, further, an additional movement of the detector and/or a scan unit is carried out.

11. The method according to claim 1, for optical detection of characteristic quantities of the wavelength-dependent behavior of an illuminated specimen, particularly the emission behavior and/or absorption behavior, preferably the fluorescence and/or luminescence and/or phosphorescence and/or enzyme-active light emission and/or enzyme-active fluorescence.

12. The method according to claim 1, for distinguishing different dyes and/or for determining the local dye composition of an image point when a plurality of dyes are used simultaneously and/or for determining the local shift of the

emission spectrum depending on the local environment to which the dye or dyes is or are attached and/or for measuring emission ratio dyes for determining ion concentrations.

13. The method according to claim 1, for distinguishing different dyes and/or for determining the local dye composition of an image point when a plurality of dyes are used simultaneously and/or for determining the local shift in the absorption spectrum depending on the local environment to which the dye or dyes is or are attached and/or for measuring the absorption ratio for determining ion concentrations.

14. The method according to claim 1, wherein the emission radiation of the specimen is split by a dispersive element and is detected in a spatially resolved manner in at least one direction.

15. The method according to claim 1, wherein signals of detection channels are converted and digitally read out and calculation of the algorithm is carried out digitally in a computer.

16. The method according to claim 15, wherein the signals of the detector channels are influenced by a nonlinear distortion of the input signals.

17. The method according to claim 1, wherein the integration parameters are influenced.

18. The method according to claim 1, wherein the characteristic or response curve of an amplifier is influenced.

19. The method according to claim 1, wherein the calculated intermediate values and/or detected signals are/is used for generating an image.

20. The method according to claim 1, wherein a calculation of the intermediate values is carried out for refining measurement curves in a stepwise manner.

21. The method according to claim 1, wherein a color-coded fluorescence image is generated.

22. The method according to claim 1, wherein a superposition is carried out with additional images.

23. The method according to claim 1, wherein a comparison of the measured signal with a reference signal is carried out via comparators in detection channels and in case the reference signal is not reached and/or is exceeded a change in the operating mode of the detection channel is carried out.

24. The method according to claim 1, wherein the respective detection channel is switched off and/or not taken into account.

25. The method according to claim 1, wherein the relevant spectral region is narrowed in this way.

26. The method according to claim 1, wherein the signals of the detection channels are generated by at least one integrator circuit.

27. The method according to claim 1, wherein the signals of the detection channels are generated by photon counting and subsequent digital-to-analog conversion.

28. The method according to claim 1, wherein the photon

counting is carried out in time correlation.

29. The method according to claim 1, for detection of single-photon and/or multiphoton fluorescence and/or fluorescence excited by entangled photons.

30. The method according to claim 1, with parallel illumination and detection, in ingredient screening, wherein the specimen is a microtiter plate.

31. The method according to claim 30, employing linewise detection.

32. The method according to claim 1, in a microscope.

33. The method according to claim 1, for detection in a nearfield scanning microscope.

34. The method according to claim 1, for detection of a single-photon and/or multiphoton dye fluorescence in a fluorescence-correlated spectroscope.

35. The method according to claim 1, by confocal detection.

36. The method according to claim 1, using a scanning arrangement.

37. The method according to claim 1, using an X-Y scanner in the illumination means.

38. The method according to claim 1, using an X-Y scan table.

39. The method according to claim 1, using nonconfocal detection.
40. The method according to claim 1, using descanned detection.
41. The method according to claim 1, using brightfield imaging.
42. The method according to claim 1, using point imaging.
43. The method according to claim 1, using non-descanned detection.
44. The method according to claim 1, using brightfield imaging.
45. The method according to claim 1, using non-scanning, confocal or nonconfocal detection and point imaging or brightfield imaging.
46. The method according to claim 1, using an X-Y scan table.
47. An arrangement for optical detection of characteristic quantities of an illuminated specimen, comprising:
 - a detector for detecting a signal that is backscattered, reflected and/or fluoresced and/or absorbed from the specimen, said detector being a spatially revolving detector wherein radiation coming from the specimen is imaged on the detector;
 - means for imaging a radiation signal that is backscattered, reflected and/or fluoresced and/or absorbed from the specimen, on the detector;
 - means for shifting the position of the radiation which is measured in a spatially resolved manner relative to the detector; and

means for determining intermediate values using an algorithm from the signals measured in different shifts for purposes of increasing the spatial resolution of the detector.

48. The arrangement according to claim 47, wherein the step size of the shift is below the raster dimension of the spatial resolution of the detector.

49. The arrangement according to claim 47, wherein there is carried out a displacement of the detector in the direction of its spatial resolution and/or a displacement or swiveling of an imaging element in at least one axis and/or a displacement or swiveling of a reflective element in at least one axis and/or a displacement or swiveling of a dispersive element in at least one axis.

50. The arrangement according to claim 47, wherein a spectrally resolved measurement of spectra is carried out by a dispersive element arranged in front of the detector.

51. The arrangement according to claim 50, wherein the dispersive element is swivelable around at least one axis.

52. The arrangement according to claim 47, wherein with a dispersive element remaining stationary in at least one of its swiveling axes, the spatially changing effect of the swiveling in this axis is carried out by a scan unit.

53. The arrangement according to claim 47, wherein in a line scanner for real-time microscopy a displacement is carried out by a mirror which is swivelable about at least one axis and/or a displacement of the detector and/or a mirror of a scanning mirror arrangement is carried out.

54. The arrangement according to claim 47, wherein with a mirror

remaining stationary in at least one of its swiveling axes, the spatially changing effect of the swiveling in this axis is carried out by a scan unit.

55. The arrangement according to claim 47, wherein switching is carried out between a line scan and a dispersive splitting.

56. The arrangement according to claim 47, wherein a dispersive element is swiveled for increasing the spectral resolution and, further, an additional movement of the detector and/or a scan unit is carried out.

57. The arrangement according to claim 47, for optical detection of characteristic quantities of the wavelength-dependent behavior of an illuminated specimen, particularly the emission behavior and/or absorption behavior, preferably the fluorescence and/or luminescence and/or phosphorescence and/or enzyme-active light emission and/or enzyme-active fluorescence.

58. The arrangement according to claim 47, for distinguishing different dyes and/or for determining the local dye composition of an image point when a plurality of dyes are used simultaneously and/or for determining the local shift of the emission spectrum depending on the local environment to which the dye or dyes is or are attached and/or for measuring emission ratio dyes for determining ion concentrations.

59. The arrangement according to claim 47, for distinguishing different dyes and/or for determining the local dye composition of an image point when a plurality of dyes are used simultaneously and/or for determining the local shift in the absorption spectrum depending on the local environment to which the dye or dyes is or are attached and/or for measuring the absorption ratio for determining ion concentrations.

60. The arrangement according to claim 47, wherein the emission radiation of the specimen is split by a dispersive element and is detected in a spatially resolved manner in at least one direction.

61. The arrangement according to claim 47, wherein signals of detection channels are converted and digitally read out and calculation of the algorithm is carried out digitally in a computer.

62. The arrangement according to claim 47, wherein the signals of detector channels are influenced by a nonlinear distortion of the input signals.

63. The arrangement according to claim 47, wherein the integration parameters are influenced.

64. The arrangement according to claim 47, wherein the characteristic or response curve of an amplifier is influenced.

65. The arrangement according to claim 47, wherein the calculated intermediate values and/or detected signals are/is used for generating an image.

66. The arrangement according to claim 47, wherein a color-coded fluorescence image is generated.

67. The arrangement according to claim 47, wherein a superposition is carried out with additional images.

68. The arrangement according to claim 47, wherein a comparison of the measured signal with a reference signal is carried out via comparators in detection channels and in case the reference signal is not reached and/or is exceeded a change in the operating mode of the detection channel is carried out.

69. The arrangement according to claim 47, wherein the respective detection channel is switched off and/or not taken into account.

70. The arrangement according to claim 47, wherein the relevant spectral region is narrowed in this way.

71. The arrangement according to claim 47, wherein signals of the detection channels are generated by at least one integrator circuit.

72. The arrangement according to claim 47, wherein signals of the detection channels are generated by photon counting and subsequent digital-to-analog conversion.

73. The arrangement according to claim 47, wherein the photon counting is carried out in time correlation.

74. The arrangement according to claim 47, for detection of single-photon and/or multiphoton fluorescence and/or fluorescence excited by entangled photons.

75. The arrangement according to claim 47, with parallel illumination and detection, in ingredient screening, wherein the specimen is a microtiter plate.

76. The arrangement according to claim 75, with linewise detection.

77. The arrangement according to claim 47, incorporated in a microscope.

78. The arrangement according to claim 77, for detection in a nearfield scanning microscope.

79. The arrangement according to claim 47, for detection of a single-photon and/or multiphoton dye fluorescence in a fluorescence-correlated spectroscopy.

80. The arrangement according to claim 47, incorporating confocal detection.

81. The arrangement according to claim 47, including a scanning arrangement.

82. The arrangement according to claim 47, including an X-Y scanner in the illumination source.

83. The arrangement according to claim 47, including an X-Y scan table.

84. The arrangement according to claim 83, incorporating nonconfocal detection.

85. The arrangement according to claim 47, including a scanning arrangement.

86. The arrangement according to claim 47, including descanned detection.

87. The arrangement according to claim 47, with brightfield

imaging.

88. The arrangement according to claim 47, with point imaging.
89. The arrangement according to claim 47, incorporating non-descanned detection.
90. The arrangement according to claim 47, with non-scanning, confocal or nonconfocal detection and point imaging or brightfield imaging.